

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 4410-11-3 (1973): Glossary of terms relating to river valley projects, Part 11: Hydrology: Section 3: Infiltration and water losses [WRD 3: Ground Water and Related Investigations]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



Indian Standard

**GLOSSARY OF TERMS RELATING TO
RIVER VALLEY PROJECTS**

PART XI HYDROLOGY

Section 3 Infiltration and Water Losses

(Second Reprint FEBRUARY 1989)

UDC 001.4:627.81:624.131.64

© Copyright 1973

**BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002**

*Indian Standard*GLOSSARY OF TERMS RELATING TO
RIVER VALLEY PROJECTS

PART XI HYDROLOGY

Section 3 Infiltration and Water Losses

Terminology Relating to River Valley Projects Sectional
Committee, BDC 46*Chairman*

SHRI I. P. KAPILA

*Representing*Power Development Department, Government of
Jammu and Kashmir*Members*

SHRI B. S. BHALLA

Beas Designs Organization (Ministry of Irrigation &
Power)

CHIEF ENGINEER

Public Works Department, Government of Tamil
NaduSUPERINTENDING ENGINEER (*Alternate*)

DIRECTOR

Land Reclamation, Irrigation & Power Research
Institute, Amritsar

DIRECTOR (HYDROLOGY)

Central Water & Power Commission, New Delhi

SHRI N. K. DWIVEDI

Irrigation Department, Government of Uttar Pradesh

SHRI K. C. GHOSAL

Alok Udyog Cement Service, New Delhi

SHRI A. K. BISWAS (*Alternate*)

SHRI N. K. GHOSH

Public Works Department, Government of West
Bengal

SHRI R. L. GUPTA

Public Works Department, Government of Madhya
PradeshSUPERINTENDING ENGINEER
(*DESIGNS*) (*Alternate*)

DR R. C. HOON

In personal capacity (*M 18 New Delhi South Extension,
Part II, New Delhi 16*)

SHRI M. S. JAIN

Geological Survey of India, Calcutta

SHRI T. S. MURTHY

National Projects Construction Corporation Ltd,
New DelhiSHRI K. N. TANEJA (*Alternate*)

SHRI M. VENKATA RAO

Public Works Department, Government of Andhra
Pradesh

SHRI R. K. SAHU

Irrigation & Power Department, Government of
Orissa(*Continued on page 2*)

© Copyright 1973

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(Continued from page 1)

<i>Members</i>	<i>Representing</i>
SHRI E. C. SALDANHA	Irrigation & Power Department, Government of Maharashtra
SHRI V. S. GUPTA (<i>Alternate</i>)	
PROF SARANJIT SINGH	Indian Institute of Technology, New Delhi
DR P. P. SEHGAL	University of Roorkee
COL N. K. SEN	Survey of India, Dehra Dun
COL P. MISRA (<i>Alternate</i>)	
SHRI G. S. SIDHU	Irrigation Department, Government of Punjab
SHRI M. M. ANAND (<i>Alternate</i>)	
SOIL CONSERVATION ADVISER	Ministry of Food, Agriculture, Community Development & Co-operation
SHRI VIJENDRA SINGH	Irrigation Department, Government of Uttar Pradesh
SHRI D. AJITHA SIMHA, Director (Civ Engg)	Director General, ISI (<i>Ex-officio Member</i>)

Secretary

SHRI K. RAGHAVENDRAN
Deputy Director (Civ Engg), ISI

Panel for Glossary of Terms Relating to Hydrology, BDC 46 : P6

Convener

PROF SARANJIT SINGH Indian Institute of Technology, New Delhi

Members

SHRI S. BANERJI	National Committee for International Hydrological Decade, New Delhi
DIRECTOR (HYDROLOGY)	Central Water & Power Commission, New Delhi
DEPUTY DIRECTOR (HYDROLOGY)	
(<i>Alternate</i>)	
SHRI M. M. LAL KHANNA	Irrigation Research Institute, Roorkee
DR K. V. RAGHAVA RAO	Central Ground Water Board, Faridabad
DR SUBHASH CHANDER	Indian Institute of Technology, New Delhi

Indian Standard

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS

PART XI HYDROLOGY

Section 3 Infiltration and Water Losses

0. FOREWORD

0.1 This Indian Standard (Part XI/Sec 3) was adopted by the Indian Standards Institution on 28 March 1973, after the draft finalized by the Terminology Relating to River Valley Projects Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A number of Indian Standards have already been printed covering various aspects of river valley projects and a large number of standards are in the process of formulation. These standards include technical terms, the precise definitions of which are required to avoid ambiguity in their interpretation. To achieve this end, this Institution is bringing out IS : 4410 'Glossary of terms relating to river valley projects', which is being published in parts.

0.3 Part XI covers the important field of hydrology which is a separate science by itself. In view of the vastness of this subject, it is proposed to cover the subject in different sections. Other sections in the series will be the following:

Section 1	General terms
Section 2	Precipitation and runoff
Section 4	Hydrographs
Section 5	Floods
Section 6	Ground water
Section 7	Discharge measurements
Section 8	Quality of waters

0.4 In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from the following publications:

UNITED NATIONS. ECONOMIC COMMISSION FOR ASIA AND THE FAR EAST.
Glossary of hydrologic terms used in Asia and the Far East. 1956.
Bangkok

INDIA. INTERNATIONAL COMMISSION ON IRRIGATION AND DRAINAGE.
Multilingual technical dictionary on irrigation and drainage. 1967

INDIA. CENTRAL BOARD OF IRRIGATION AND POWER. Glossary of irrigation and hydro-electric terms and standard notations used in India. 1954. Manager of Publications, Delhi

Nomenclature for hydraulics. 1962. American Society of Civil Engineers. New York.

0.4.1 All the definitions taken from ' Multilingual technical dictionary on irrigation and drainage ' are marked with asterisk (*) in the standard.

1. SCOPE

1.1 This standard (Part XI/Section 3) covers the definitions of terms relating to infiltration and water losses in hydrology.

2. DEFINITIONS

2.1 Adhesive Water — Water forming a film around soil particles over adsorbed water and held by the forces of molecular attraction, but with less strength than adsorption water and without perceptible emission of heat. Adsorbed water is entirely fixed, whereas adhesive or pellicular water may move from one particle to another.

2.2 Atmidometer — An instrument for measuring evaporation.

2.3 Atmometer — See 2.2.

2.4 Capillary Fringe — Water in the zone immediately above the water-table. It may consist solely of capillary water (called capillary fringe) or it may be combined with gravity water in transit to the water-table.

2.5 Capillary Water — Water held in soil above water-table by capillary action.

2.6 Consumptive Use* — The quantity of water used by the vegetative growth of a given area in transpiration or building of plant tissue and that evaporated from the soil or from intercepted precipitation on the area in any specified time. It is expressed in water-depth units or depth-area units per unit area and for specified periods, such as days, months and seasons.

2.7 Evaporation

a) The process by which the water is changed from the liquid state to a gaseous state below the boiling point through the transfer of heat energy.

b) The quantity of water that is evaporated; the rate is expressed in depth of water, measured as liquid water, removed from a specified surface per unit of time generally in millimetre per day, month or year.

2.8 Evaporation Opportunity — Ratio of actual rate of evaporation from land or water surface in contact with the atmosphere to the potential rate of evaporation under existing atmospheric conditions.

2.9 Evaporation Pan* — An experimental tank used to determine the amount of evaporation from the surface of water under measured or observed climatic and cultural conditions.

2.10 Evaporation Station* — A station set up on the surface of body of water or on land for making evaporation measurements.

2.11 Evaporation Tank* — *See 2.9.*

2.12 Evaporativity — The rate of evaporation under existing atmospheric conditions from the surface of a body of water that is chemically pure and that has the temperature of the atmosphere and the surface is exposed parallel to the wind. It is generally expressed in terms of the depth of water removed from such surface in a given unit of time.

2.13 Evaporimeter — *See 2.2.*

2.14 Evaporometer — *See 2.2.*

2.15 Evapo-transpiration* — *See 2.6.*

2.16 Field Capacity — The amount of water held in the soil after the excess gravitational water has drained away and after the rate of downward movement of water has materially decreased. Essentially the same as 'specific retention', a more general term used in studies of ground water which covers all types of strata. Furthermore, field capacity is usually expressed as a percentage of weight whilst specific retention is generally given as percentage by volume.

2.17 Free Water — *See 2.19 (b).*

2.18 Fringe Water — *See 2.4.*

2.19 Gravitational Water

a) Water in excess of adsorption water and pellicular water seeping towards water-table.

b) Water which drains through the soil under the influence of gravity.

2.20 Gravity Suspended Water — *See 2.19 (a).*

2.21 Ground Water Recharge — Replenishment of a depleted aquifer by injection or infiltration of water from surface.

2.22 Hygroscopic Moisture* — Water in the zone of aeration adsorbed on the surface of soil particles in equilibrium with atmospheric water vapour.

The water is not capable of movement through the action of gravity or capillary forces and can only be driven by heat.

2.23 Hygroscopic Water — See 2.22.

2.24 Infiltration — The entrance of water into the soil or other porous material through the interstices or pores of a soil or other porous medium.

2.25 Infiltration Capacity — Maximum rate at which specified soil in given condition can absorb water.

2.26 Infiltration Capacity Curve — Curve showing what the infiltration rate would be at any period during a specific storm if the rainfall intensity were to equal or exceed the capacity at that instant (see Fig. 1).

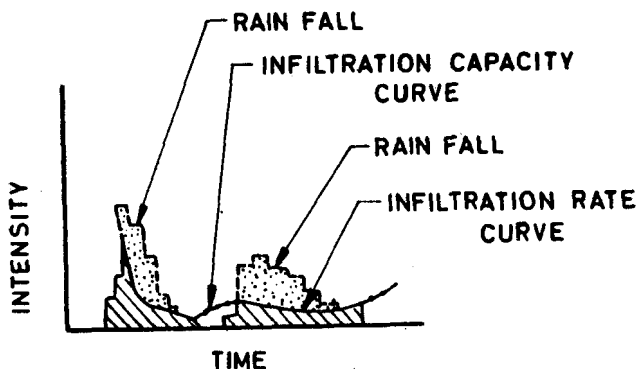


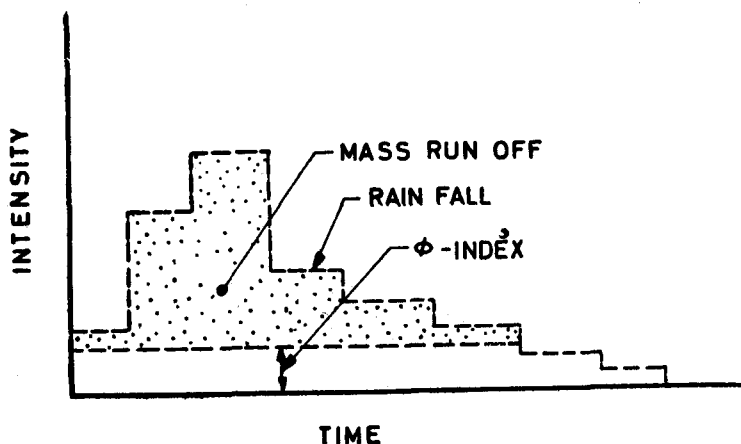
FIG. 1 TYPICAL INFILTRATION RATE AND INFILTRATION CAPACITY CURVES

2.27 Infiltration Head — The head of water which causes infiltration.

2.28 Infiltration Indices — The following three types commonly used are given in 2.28.1, 2.28.2 and 2.28.3.

2.28.1 ϕ -Index — The average rainfall intensity above which the volume of rainfall equals the volume of observed runoff and equals total basin discharge divided by the duration of rainfall provided that the rainfall intensity is continuously in excess of the index (see Fig. 2).

2.28.2 W -Index — The average rate of infiltration during the time the rainfall intensity exceeds the infiltration capacity.

FIG. 2 TYPICAL SKETCH SHOWING ϕ -INDEX

2.28.3 W_{min} -Index — With very wet conditions, when the retention rate is at minimum, the values of W -index and ϕ -index are almost identical and ' W -index ' is termed as W_{min} -index.

2.29 Infiltration Rate — The rate at which infiltration takes place expressed in depth of water per unit of time usually in mm per hour.

2.30 Infiltration Rate Curve — Curve showing the actual rate of infiltration during a particular storm (see Fig. 1).

2.31 Infiltrometer — A device by which the rate and amount of water percolating into the soil is determined.

2.32 Initial Abstraction — Maximum amount of rainfall that can be absorbed under specific conditions without producing runoff. Also referred to as ' initial losses '

2.33 Initial Retention — Total amount of rainfall that may fall without causing a significant amount of direct runoff.

2.34 Lysimeter — A device used to measure the quantity or rate of downward water movement through a block of soil usually undisturbed, or to collect such percolated water for analysis as to quality.

2.35 Mean Annual Evaporation* — The mean value in depth units of evaporation, the period of observation being of adequate duration to secure approximate constancy.

2.36 Pellicular Water — *See 2.1.*

2.37 Percolation — Flow through a porous substance.

2.38 Phytometer — Device for measuring transpiration, consisting of vessel containing soil in which one or more plants are rooted and sealed so that water can escape only by transpiration from plant.

2.39 Ponding — Temporary holding of water by natural or artificial means for various purposes, such as ground water recharge, flood control, irrigation, etc.

2.40 Potential Evapo-transpiration — The amount of water utilized by plant growth plus evaporation from the soil if the soil contained sufficient moisture for plant growth at all times.

2.41 Potential Rate of Evaporation — *See 2.12.*

2.42 Psychrometer* — A hygrometer, or instrument for measuring the aqueous vapour in the atmosphere, consisting essentially of two similar thermometers, the bulb of one being kept wet.

2.43 Relative Evaporation — *See 2.8.*

2.44 Relative Humidity — The ratio expressed as percentage of the actual quantity of water present in a given volume to the quantity of water vapour required for saturation at the same temperature.

2.45 Retention* — That part of the precipitation falling on a drainage area which does not escape as surface stream flow during a given period. It is the difference between total precipitation and total runoff during the period and represents evaporation, transpiration, subsurface leakage, infiltration and when short periods are considered, temporary surface or underground storage on an area. When periods of several years are considered, it approximates consumptive use.

2.46 Seepage — Slow percolation generally associated with flow in an unsaturated medium. Seepage into a body is termed 'influent seepage' and that away from a body as 'effluent seepage'. The difference between percolation and seepage is that the latter is through unsaturated material while the former is through saturated material.

2.47 Soil Evaporation — Evaporation of water from moist soils.

2.48 Specific Retention — *See 2.16.*

2.49 Stream-Flow Depletion* — The amount of water that flows into a valley, or into a particular land area, minus the amount that flows out of the valley or off the particular land area.

2.50 Transpiration — The process by which plants dissipate water from their leaf and body surfaces in the phenomena of growth.

2.51 Transpiration Ratio — The ratio of the weight of water passed through a plant to the weight of dry plant substance produced.

2.52 Vadose Water — See 2.19 (a).

2.53 Water Shed Leakage* — The geological formation under many drainage basins is such that precipitation falling on one basin finds its way underground through fissures and water bearing strata to an outlet either in a nearby or a remote drainage basin, or directly to the sea. This is called 'water shed leakage'.

2.54 Wilting Coefficient* — The moisture content of the soil, expressed as a percentage of the dry weight at the time when the leaves of a plant growing in the soil first undergo a permanent reduction in their moisture content, as the result of the deficiency in the soil moisture supply.

2.55 Wilting Percentage* — See 2.54.

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 3 31 01 31, 3 31 13 75

Telegrams : Manaksanstha
(Common to all Offices)

Regional Offices :

Telephone

*Western ; Manakalaya, E9 MIDC, Marol, Andheri (East) BOMBAY 400093 6 32 92 95

†Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054 36 24 99

Northern : SCO 445-446, Sector 35-C CHANDIGARH 160036 { 2 18 43
3 16 41

Southern : C. I. T. Campus, MADRAS 600113 { 41 24 42
41 25 19
41 29 16

Branch Offices :

Pushpak, Nurmohamed Shaikh Marg, Khanpur, AHMADABAD 380001 { 2 63 48
2 63 49

'F' Block, Unity Bldg, Narasimharaja Square, BANGALORE 560002 22 48 05

Gangotri Complex, 5th Floor, Bhadbhada Road, T. T. Nagar, BHOPAL 462003 6 27 16

Plot No. 82/83, Lewis Road, BHUBANESHWAR 751002 5 36 27

53/5 Ward No. 29, R. G. Barua Road, 5th Byelane, GUWAHATI 781003 —

5-8-56C L. N. Gupta Marg, (Nampally Station Road), HYDERABAD 500001 22 10 83

R14 Yudhister Marg, C Scheme, JAIPUR 302005 { 6 34 71
6 98 32

117/418B Sarvodaya Nagar, KANPUR 208005 { 21 68 76
21 82 92

Patliputra Industrial Estate, PATNA 800013 6 23 05

Hantex Bldg (2nd Floor), Rly Station Road, TRIVANDRUM 695001 52 27

Inspection Office (With Sale Point) :

Institution of Engineers (India) Building, 1332 Shivaji Nagar, PUNE 410005 5 24 35

*Sales Office in Bombay is at Novelty Chambers, Grant Road, Bombay 400007 89 65 28

†Sales Office in Calcutta is at 5 Chowringhee Approach, P. O. Princep Street, Calcutta 700072 27 68 00

Reprography Unit, BIS, New Delhi, India